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# ENERGY CONSERVATION MATERIALS PACKAGE

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# District Level Plan for Conservation

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# AN OUTLINE FOR A DISTRICT-LEVEL PLAN FOR ENERGY CONSERVATION

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## AN OUTLINE FOR A DISTRICT-LEVEL PLAN FOR ENERGY CONSERVATION

There is, of course, no single format for an energy conservation program which will adequately fill the needs of all school districts. There are too many variables involved from one region of the country to the next. In the process of reviewing a number of conservation programs there are several features that are shared by all successful conservation efforts. These include:

a) The formation of a district energy conservation committee or team which involves as many segments of the educational community as is practical.

b) The assignment of specific responsibilities to specific individuals.

c) Careful planning in the development of guidelines.

d) The recording of energy use patterns--an "energy audit"--for each building in the district.

e) Persistent follow-up and evaluation efforts to see that established guidelines are followed.

### The District Energy Conservation Team

The word "team" is important here. Any conservation effort, if it is to be successful, must have the cooperation from all elements of the educational community. The size and composition of the team will vary according to the needs and aims of the school district involved. A typical energy conservation team from a large school district might involve the following persons:

The Superintendent or his representative

Building principals or their assistants

A district energy manager (a person assigned the specific task of administering the energy conservation program)

Food Services personnel

The district business manager

A representative from the Parent Teachers Association

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Note: In the report that follows we have relied heavily although not exclusively upon the experience of Colorado's Northglenn school district which has had extensive experience organizing and conducting a conservation program. During the first nine months of 1974 this suburban district saved an average of over $3,000 per month on its gas and electricity bills in spite of a 5% increase in rates.

A representative from the board of education

Teachers

Students

Maintenance and custodial staff

A representative from the utilities company serving the district

Outside professionals such as architects and architectural engineers

Trasnportation staff

It is suggested that the selection process for this committee be conducted thoroughly and carefully. Persons selected should be sincerely interested in the project and there should be a reasonable expectation that they will actively participate.

Some observations on the categories of personnel involved in the team: The Northglenn experience suggests that it is highly important that the district superintendent be "visible" in all phases of the program either through his representative or, preferably, in person. The presence of the superintendent lends the sense of direction and purpose to the conservation effort. It is also important that one person be selected as team leader.

In Northglenn, a district-level maintenance team was organized. This team made regular visitations to each school to assess its energy usage and its conservation needs.

It is suggested that wherever possible, conservation teams be organized on the school building level as well.

## Specific Duties for Specific People

The implementation of the guidelines drawn up by the district conservation team must not be left up to chance or the good intentions of the program participants. Conservation programs are effective only when specific tasks are made the responsibility of specific individuals. Moreover, it is important that each member of the district team be aware of the person responsible for specific duties. Wherever possible there should be some system that insures that persons signify in writing that their task has been completed. (See below, section on checklists.)

## Planning for the Development of Guidelines

There should be ample time set aside for the planning phase of any conservation program. Participants should be notified well in advance of the time, place, and purpose of the planning meeting. An agenda should be prepared well ahead of time. If the scope and intent of the program warrants, more than one meeting may be necessary. Organizers should not be discouraged if this planning phase seems to be eating up time: A successful conservation program is founded on careful planning and well-thought-out procedures.

The following are some suggested agenda items that might be explored during the planning and organization meetings of the conservation team:

- --The assignment of responsibilities and tasks to specific groups and individuals
- --A thorough review of the district's energy situation
- --Strategies for the involvement of the entire educational community
- --The planning of an energy audit for the school district
- --The formulation of evaluative and follow-up procedures
- --The setting of goals and the establishment of time-frames for the achievement of these goals
- --The planning of a public information program to inform district personnel and the community about the existence of the project and its goals
- --The preparation of energy conservation checklists for district and school building use
- --The possibility of consulting outside experts in the field of energy management

## An Energy Audit System

The Energy Audit System involves developing a record of the energy use patterns in each building in the district. (Not just schools but garages, storage areas, and administrative buildings as well.) The Energy Audit is an indispensable tool in any conservation program. It serves the following purposes:

1) It shows where energy money is going and therefore pinpoints areas where energy savings are possible by providing monthly energy cost comparisons

2) It makes possible the preparation of an "energy budget" so that administrators can begin to think of dollars and BTU's in the same terms

3) An Energy Audit, by showing graphically where energy costs are concentrated, encouraged students, teachers, and administrators to try harder to cut energy waste

A school district should attempt to collect a base amount of information on each of its plants. At the very least this should include:

1) The type and amount of each fuel used

2) The amount of electricity used

3) The peak demand level for this electricity

District personnel may meet with some initial difficulty in establishing the history of a plant's energy usage. Records may not have been properly maintained or they may be difficult to locate. But as information gathering techniques become more advanced, the audit procedures will be made to yield more useful information such as energy dollar cost per student, per plant, per square foot, etc.

It should be mentioned here that very often the utilities company serving the school district offer their help and cooperation in conducting Energy Audits and usage measurements. In some regions this service is provided free of cost to the district.

A number of different audit forms are included in this report for the reader's inspection.

## Follow-up and Evaluation Procedures

Even the best of programs tend to lose momentum with time. Follow-up efforts should be planned in order to overcome any inertia that may set in. This can be managed in a number of ways but it is essential that people, not just paper, be involved in this process. For example, a letter from the superintendent urging principals to step up their conservation efforts is not half as effective as a constructive visitation from a district maintenance team to identify energy consumption problems and correct them. These visitations, by the way, should be done in the spirit of rendering assistance and should not be undertaken so as to pose a threat to the school's principal or its maintenance and custodial staff. It is important that all district personnel in-

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Note: Goals that are established in the early stages of the program should be realistic. Energy waste is an ingrained habit in this country and the best of energy conservation programs take time to establish and implement. There should be room for flexibility so that goals set early in the project can be revised.

volved in the project feel as though they are working together for a common goal.

The materials accumulated as a result of the Energy Audit will, of course, provide an excellent data base for the purpose of comparison and evaluation. It should be mentioned in this regard, however, that some disagreement exists as to whether the results of the monthly Energy Audits for district plants should be published. Those who argue negatively say that this procedure promotes hard feelings on the part of those administrators whose schools have not done well in energy conservation efforts. The argument in favor of making these monthly audits public say that this stimulates the desire to conserve energy and encourages a spirit of competition. The Northglenn school district, incidentally, publishes the results of their audits. The district has found that, overall, the publication of results has had a positive effect.

## Checklists vs. Suggestions

In consulting this section the reader should bear in mind the distinction between a "checklist" on the one hand, and a "list of ideas" on the other.

In terms of an energy conservation program, a "checklist" sets out a list of duties for which some person is specifically responsible. In other words, a checklist is meant to be "checked off" by someone whose job it is to take care of the items in question.

The list of ideas included here may be altered or restructured so as to produce a checklist. If this is the intent of the organizers of a conservation program they should remember that in order to be effective a checklist should have at least some of the following characteristics:

1) The checklist, wherever possible, should bear the names or titles of those responsible for performing the duties on the list.

2) The list should include a space for a signature (note: a signature, not just a check mark) and, where applicable, a place to indicate the time and date when the item was taken care of.

3) Checklists, wherever possible, should be kept in a convenient and permanent location (i.e. for a transportation checklist, the bus garage--for a maintenance list, a place where the appropriate personnel are regularly located).

4) Checklists should be collected and reviewed on a regular basis by supervisory personnel.

A word of caution: The literature of energy conservation in school facilities is glutted with so-called checklists. One gets the distinct impression that too often school administrators fool themselves into thinking that simply by handing down checklists energy consumption will magically drop. Nothing could be further from the truth. Checklists are merely one means to an end, and in order to be effective they must be used properly. To repeat a point made earlier, successful programs are carried out by people, not paper. Responsibility for the handling of the checklist must be delegated and there must be some administrative mechanism to insure that this responsibility is carried out.

# SAMPLES OF AUDIT FORMS

The following pages are samples of Energy Audit and Recap Forms.

Sheet A is an Energy Audit Form used by the Texas Education Agency. This is a quarterly report for the use of school districts in reporting to the state agency, nevertheless it could be used by districts for individual school plants. Note that this form requests a comparison with a previous year.

Sheet B is a sample of an audit form used by Lake Washington School District, Kirkland, Washington. Note that this district is concerned with water consumption as well as the use of oil and electricity. Totals on this form are indicated by BTUs whether the source was gas or electricity. Note also that there is a space for indicating amount of BTUs per student and per square foot of building space.

Sheets C and D, provided by Educational Facilities Laboratories, is somewhat more sophisticated than the others. This "Self-Help Audit Form" is a report on annual fuel consumption. Note that page two of this form provides the mathematical factor for transforming measurements in KWH, MCF, and Gallons to 1000 BTUs.

Sheets E and F are district recaps of energy usage in three schools of Colorado's Northglenn District. One sheet is for electrical usage, the other is for gas. Note that usage is expressed here in kilowatt hours and cubic feet. Note also that a summary of average monthly Colorado temperatures is included so that energy use fluctuations due primarily to weather can be identified.

## SHEET A

District Name ______________

TEXAS EDUCATION AGENCY
Division of Administrative Services

Co.-Dist. # ______________

## Quarterly Energy Consumption Report

For Quarter Ending ______________

| CATEGORY | AMOUNT CONSUMED | AMOUNT CONSUMED DURING THIS PERIOD LAST YEAR |
|---|---|---|
| Electricity | ______ KWH | ______ KWH |
| Natural Gas | ______ Mcf* | ______ Mcf* |
| Gasoline | ______ gallons | ______ gallon |
| Fuel Oil | ______ gallons | ______ gallon |

*Mcf is equal to one thousand cubic feet of natural gas.

Other Fuels (specify butane, propane, etc.)

| | | |
|---|---|---|
| ______ | ______ | ______ |
| ______ | ______ | ______ |

☐ Check this box if your district would like a member of the Governor's Energy Resources.

☐ Check this box if your district presently includes energy studies and/or conservation or energy in your instructional program.

______________
Typed Name

______________
Signature of Reporting Official

______________
Date

______________
Address

Report due by last day of the month following the quarter for which the report is being made. Forward report to:

Director, Division of Administrative Services
Texas Education Agency
201 East 11th St.
Austin, Texas 78701

SHEET B

# ENERGY

# CONSUMED

TOTAL WATER CONSUMED AT SCHOOL ____________________

CU/FT WATER CONSUMED PER STUDENT ____________________

TOTAL OIL BTU'S CONSUMED AT SCHOOL ____________________

TOTAL ELECTRIC BTU'S CONSUMED AT SCHOOL ____________________

TOTAL GAS BTU'S CONSUMED AT SCHOOL ____________________

TOTAL BTU'S CONSUMED ____________________

DIVIDED BY THE NUMBER OF STUDENTS ____________________

BTU'S ENERGY CONSUMED PER STUDENT ____________________

DIVIDED BY THE SQUARE FEET IN BUILDING ____________________

BTU'S ENERGY CONSUMED PER SQ.FT. IN BUILDING ____________________

## SHEET C

Page 1 of 2

## SELF-HELP ENERGY AUDIT FORM

PLANT_______________ DISTRICT _______________ YEAR_______________

Obtain fuel and utility billing data for the full year and enter in the appropriate places in the following table. Note that the fuel columns require information on the type of fuel and the units of delivery, such as kilowatt-hours, therms, gallons, etc. Total each column except PEAK DEMAND (KW).

| | Electricity | | Fuel(s) | |
|---|---|---|---|---|
| | Usage (KWH) | Peak Demand (KW) | Type ________<br>Unit________ | Type ________<br>________ |
| JULY | | | | |
| AUGUST | | | | |
| SEPTEMBER | | | | |
| OCTOBER | | | | |
| NOVEMBER | | | | |
| DECEMBER | | | | |
| JANUARY | | | | |
| FEBRUARY | | | | |
| MARCH | | | | |
| APRIL | | | | |
| MAY | | | | |
| JUNE | | | | |
| TOTAL | | | | |

After completing the consumption table above, center the TOTAL USAGE figures on the appropriate lines of the following page;

| | | |
|---|---|---|
| Enter | ELECTRICITY USAGE | on Line (1) |
| Enter | NATURAL GAS USAGE IN THERMS | on Line (4a) |
| Enter | NATURAL GAS USAGE IN Mcf | on Line (4b) |
| Enter | #2 FUEL OIL USAGE | on Line (7a) |
| Enter | #6 FUEL OIL USAGE | on Line (7b) |
| Enter | COAL USAGE IN LBS. | on Line (10) |

## SHEET D

Page 2 of 2

PLANT ______________________ AREA __________ $ft^2$ YEAR __________

### ANNUAL PLANT ENERGY USE

| Col. A | Col. B | | Col. C | | Col. D |
|---|---|---|---|---|---|
| Annual Usage (Fuel Units) | Factor | | Annual Usage (1000 BTU/yr) | | Annual Usage (1000 BTU/yr/ft |

**Electricity:**

(1) __________ KWH x 3.4 = (2) __________ ÷ Area = (3) __________

**Natural Gas:**

(4a) __________ Therms x 100 = (5a) __________ ÷ Area = (6a) __________

(4b) __________ Mcf x 1000 = (5b) __________ ÷ Area = (6b) __________

**Fuel Oil:**

(7a) __________ Gal. #2 x 138 = (8a) __________ ÷ Area = (9a) __________

(7b) __________ Gal. #6 x 146 = (8b) __________ ÷ Area = (9b) __________

**Coal:**

(10) __________ Lbs. x 13 = (11) __________ ÷ Area = (12) __________

TOTALS (13) __________ 1000 BTU/yr (14) __________ 1000 BTU/yr/ft

### ANNUAL USAGE PER PUPIL

Annual BTU Usage ÷ Enrollment

__________ (Line 13 above) ÷ __________ = __________ BTU/yr/pupil

## SHEET E

## SCHOOL DISTRICT NO. 12, Adams County

## SUMMARY - ELECTRICAL USAGE*

September-December 1973

*All usage is listed by kilowatt hours.

### NORTHGLENN HIGH SCHOOL (191,861 sq. ft.)

| MONTH | 1972-73 | 1973-74 | NET CHANGE | PERCENT | USAGE PER SQ. FT. |
|---|---|---|---|---|---|
| Sept. | 59,080 | 73,040 | + 13,960 | + 23% | 1972 .30<br>1973 .38 |
| Oct. | 56,800 | 14,556 | - 42,244 | - 74% | 1972 .29<br>1973 .07 |
| Nov. | 52,960 | 68,760 | + 15,800 | + 29% | 1972 .27<br>1973 .35 |
| Dec. | 161,760 | 158,320 | - 3,440 | - 2% | 1972 .84<br>1973 .82 |

### THORNTON HIGH SCHOOL (64,300 sq. ft.)

| MONTH | 1972-73 | 1973-74 | NET CHANGE | PERCENT | USAGE PER SQ. FT. |
|---|---|---|---|---|---|
| Sept. | 3,967 | 4,269 | + 302 | + 8% | 1972 .06<br>1973 .06 |
| Oct. | 10,104 | 12,705 | + 2,601 | + 26% | 1972 .15<br>1973 .19 |
| Nov. | 14,363 | 16,310 | + 1,947 | + 13% | 1972 .22<br>1973 .25 |
| Dec. | 14,539 | 13,508 | - 1,031 | - 7% | 1972 .22<br>1973 .21 |

### CORONADO JUNIOR HIGH SCHOOL (40,166 sq. ft.)

| MONTH | 1972-73 | 1973-74 | NET CHANGE | PERCENT | USAGE PER SQ. FT. |
|---|---|---|---|---|---|
| Sept | 8,170 | 9,550 | + 1,380 | + 16% | 1972 .20<br>1973 .23 |
| Oct. | 12,788 | 11,760 | - 1,028 | - 8% | 1972 .31<br>1973 .29 |
| Nov. | 13,626 | 13,746 | + 120 | + .8% | 1972 .33<br>1973 .34 |
| Dec. | 10,000 | 14,734 | + 4,734 | + 47% | 1972 .24<br>1973 .36 |

### SUMMARY OF AVERAGE MONTHLY TEMPERATURES (Colorado)

|  | 1972 | 1973 | Loss (-) Gain (+) |  |  |
|---|---|---|---|---|---|
| Sept. | 62.1° | 59.9° | - 2.2° | = | 4% Loss |
| Oct. | 52.0° | 54.5° | + 2.5° | = | 5% Gain |
| Nov. | 32.9° | 39.5° | + 6.6° | = | 17% Gain |
| Dec. | 24.9° | 31.6° | + 6.7° | = | 21% Gain |

# SHEET F

## SCHOOL DISTRICT NO. 12, Adams County

## SUMMARY - GAS USAGE*

September-December 1973

*All usage is listed by cubic feet.

### NORTHGLENN HIGH SCHOOL (191,861 sq. ft.)

| MONTH | 1972-73 | 1973-74 | NET CHANGE | PERCENT | USAGE PER SQ. FT. |
|---|---|---|---|---|---|
| Sept. | 12,047 | 9,486 | - 2,561 | - 21% | 1972 .062<br>1973 .049 |
| Oct. | 76,868 | 15,312 | -61,556 | - 80% | 1972 .400<br>1973 .079 |
| Nov. | 25,422 | 13,979 | -11,443 | - 45% | 1972 .132<br>1973 .072 |
| Dec. | 36,874 | 24,734 | -12,140 | - 33% | 1972 .192<br>1973 .129 |

### THORNTON HIGH SCHOOL (64,300 sq. ft.)

| MONTH | 1972-73 | 1973-74 | NET CHANGE | PERCENT | USAGE PER SQ. FT. |
|---|---|---|---|---|---|
| Sept. | 591 | 593 | + 2 | + .33% | 1972 .009<br>1973 .009 |
| Oct. | 11,683 | 6,251 | - 5,432 | - 46% | 1972 .181<br>1973 .097 |
| Nov. | 11,076 | 9,574 | - 1,502 | - 13% | 1972 .172<br>1973 .148 |
| Dec. | 21,431 | 14,139 | - 7,292 | - 34% | 1972 .333<br>1973 .219 |

### CORONADO JUNIOR HIGH SCHOOL (40,166 sq. ft.)

| MONTH | 1972-73 | 1973-74 | NET CHANGE | PERCENT | USAGE PER SQ. FT. |
|---|---|---|---|---|---|
| Sept. | 1,550 | 376 | - 1,174 | - 76% | 1972 .038<br>1973 .009 |
| Oct. | 1,990 | 3,668 | + 1,678 | + 84% | 1972 .049<br>1973 .091 |
| Nov. | 5,666 | 4,062 | - 1,604 | - 28% | 1972 .141<br>1973 .101 |
| Dec. | 8,642 | 5,917 | - 2,725 | - 31% | 1972 .215<br>1973 .147 |

### SUMMARY OF AVERAGE MONTHLY TEMPERATURES (Colorado)

|  | 1972 | 1973 | Loss (-)<br>Gain (+) |  |  |
|---|---|---|---|---|---|
| Sept. | 62.1° | 59.9° | - 2.2° | = | 4% Loss |
| Oct. | 52.0° | 54.5° | + 2.5° | = | 5% Gain |
| Nov. | 32.9° | 39.5° | + 6.6° | = | 17% Gain |
| Dec. | 24.9° | 31.6° | + 6.7° | = | 21% Gain |

Note: This is a list of suggestions. Not all of these ideas will be practical or necessary in all situations.*

## HEATING, VENTILATION, AIR CONDITIONING

### Heating

Vacuum clean tubes on all boilers at regular intervals to obtain maximum operating efficiency.

In multi-boiler systems, eliminate as many boilers as possible and still maintain heat.

Keep tubes in condensors clean to maximize heat transfer.

Close and cover baffles and vents on rooftop or window air conditioners during the heating season.

Treat boiler water chemically to reduce scale.

Maintain fuel/air ratio specified by manufacturers to ensure maximum combustion and minimum soot production. The insulating effect of a one-eighth inch layer of soot can add 8% to a furnace's fuel consumption.

Maintain proper burner alignment and condition. Determine the efficiency of each unit. Clean burner nozzles daily. Drain air tanks daily.

Carry out a monthly combustion analysis to assure optimum efficiency.

Provide for adequate combustion air in the boiler room.

Keep fuel oil at the recommended temperature at burner tip to ensure proper viscosity for complete combustion and to keep heat transfer surfaces soot free.

Clean all combustion air blowers monthly or oftener.

Lower the temperature setting for hot water that is heated electrically to the lowest acceptable level determined by building codes.

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* IECL wishes to extend its thanks to the Ventura Public Schools, Ventura, California, and to the University of the State of New York whose conservation checklists and energy usage guidelines were consulted in drawing up this list of suggestions.

## Ventilation

Do not allow the ventilating system to take in any outside air during the first half-hour of heating startup. Schools that have been empty for 12 hours or more are ventilated sufficiently by ordinary leakage.

Reduce outside ventilation to the fewest changes per hour that state and local codes permit. Consider no more than one air change per hour.

Check outside air dampers and controls regularly to be sure they are functioning properly.

Do not take in fresh air during unoccupied hours.

Regulate dampers on unit ventilators on buildings to reduce the amount of outside air brought in.

Be sure exhaust fans operate no more frequently than required. Put them on timers. Reduce speed.

Change or clean air filters on a regular basis.

Operate ventilation fans in kitchens and home economic classrooms only when cooking equipment is being used.

Do not operate air-handling units in rooms where the windows or doors are open.

## Air Conditioning

Service air conditioners on a regular basis. Make sure maintenance men check and repair cooling towers; replenish refrigerant; examine fans, pumps, compressors, and other rotating equipment for poor seals, belt slippage, and other defects; check calibration of controls; and change filters.

Do not cool below a prescribed temperature, and do not operate air conditioning equipment when school is unoccupied.

Examine equipment to determine if several air conditioning systems can be combined to eliminate need to run and maintain several systems.

## LIGHT(S)

Open window shades and draperies so as to take advantage of natural light on sunny days.

Install switches in rooms so that lights near windows can be turned off when there is sufficient natural light in that area.

Install a number of separate lighting circuits or dimmers for areas where high levels of lighting are needed only periodically.

Paint rooms and dividers with colors that reflect light. Keep walls, ceilings, and dividers clean; dark colors and dirt can reduce illumination by as much as 40 percent.

Place a brightly-colored sign next to light switches reminding people to turn off the lights in unoccupied areas.

Reset automatic timers for lights regularly to utilize all available daylight.

Check the sensitivity of automatic light controls to insure they are not triggered by fog or clouds passing over the sun.

Put lights on timers, photo cell, or astronomical clocks that turn lights off at given hours.

Outside security lights should be only bright enough to illuminate the areas needed.

When custodians are cleaning buildings at night, insist that they have lights on only in the rooms they are cleaning. When a cleaning task in a room has been completed, the lights should be turned off. Schedule daylight cleaning when possible.

Eliminate ornamental lighting.

Reduce lighting in hallways, corridors, storage areas, and outside the school to the lowest level safety and security will allow.

Initiate light turn-off programs to see that lights do not burn in unoccupied areas.

Reduce lighting levels in cafeterias, gymnasiums, and auditoriums.

Clean fluorescent tubes regularly. A tube will collect enough dust and dirt to reduce efficiency by 10 to 20 percent in 6 months and 40 percent in 2 years.

Replace lamps on a regular basis. Fluorescent tubes should be changed after 80 percent of their lamp life is used. Fluorescent lamps use more energy and produce less light during their last 20 percent of life.

Use fluorescent lights in suitable areas--they give more lumens per watt. One 40-watt fluorescent tube provides more light than three 60-watt incandescent bulbs.

Replace all outdoor and gymnasium lights with mercury vapor lamps. Use diffusers, new lens, polarizers, and special beam distributor units that can provide proper spread, focus, and use of illumination within a given space.

Inspect all light bulbs to insure that they are of the minimum voltage required.

Review recommended lighting standards. Often the so-called "minimum" standards require more light than is needed for reading and ignore non-reading activities entirely. (Lighting levels for most educational functions have doubled since 1960 and tripled since 1950.)

## CONTROLS

Make sure custodians understand how to operate temperature settings on unit ventilators so they do not confuse the low-limit settings on these units with actual thermostat settings and overheat the room.

Establish the proper balance between temperature and humidity controls.

Have heating and air conditioning systems balanced regularly so that hot and cold spots in buildings are reduced to a minimum.

Shut off or put on night setback all air-handling equipment one-half hour before school closes. The building will maintain temperatures for a long period of time after controls have been shut off or reduced.

Set thermostats at the lowest setting that will not interfere with the learning process. Reduce heat in gymnasiums, locker rooms, and auditoriums. Eliminate heating in unused rooms such as closets, stairwells, etc.

Set back thermostats during weekends and vacations. Provide for overnight setback of thermostats either manually or by means of automatic control.

## OPERATIONAL

Bring staff up to level of skill demanded by the equipment and controls. Establish an inservice training program for custodial and maintenance staffs. Utilize manufacturing representatives who can give instructions in operating pieces of equipment at maximum efficiency.

Recognize that operations and maintenance are two separate functions. Do not expect untrained, unskilled personnel to repair and maintain sophisticated equipment.

Curtail use of resistance-type electric equipment, such as space heaters, coffee pots, and hot plates.

Carefully develop specifications for the purchase of new equipment to insure that it is designed to use the minimum amount of energy.

Consolidate summer school class in adjacent rooms where possible to reduce the number of air-handling units needed. Place classes around the perimeter of the building to take advantage of natural ventilation and natural light through windows.

Schedule all evening meetings, PTA, and others for a single building so that night setback temperature can be retained in other buildings.

Encourage the wearing of warmer apparel during cold weather.

Be sure all windows fit tightly. Seal all openings around windows, doors, and other places where warm air could escape. Caulk old frames. Patch broken windows and damaged doors immediately. Double glaze windows, especially those on the north side.

Survey location of each room thermostat in relation to doors, windows, and hot or cold sources. Relocate for maximum energy savings.

Avoid blocking, heating, or cooling vents with furniture or draperies. Do not put anything on top of radiators. Keep all heating sources clear of furniture, draperies, bookcases, and files.

Allow sunlight into the building on cold days and keep it out on warm, humid days. Close drapes and blinds after school to reduce heat loss through window areas in the winter and to keep solar heat out during the summer.

Limit the number of entrances students and teachers use for arrival and departure.

Make sure that energy conservation as a subject area has a place in the school curriculum.

Schedule adult education programs to meet in rooms which receive full use during the day to utilize the existing room heat.

Encourage more efficient use of AV equipment through large group viewing.

Use centralized meeting places and combine meetings to allow personnel to travel together. Hold board meetings and PTA meetings during daylight hours where possible.

Organize work crews better to reduce travel.

Reduce the number of meetings of personnel.

## SUGGESTIONS REQUIRING MODIFICATION

Install automatic door-closing devices.

Install heat recovery systems to trap and reuse waste heat that otherwise might be exhausted into the atmosphere. Use reclaimed heat for hot water and reheat to eliminate need to operate additional equipment.

Install independent gas or electric water heaters to allow complete shutdown of boilers in summer. Shutting off boilers eliminates heat created by steam mains in the building and takes a big load off air conditioners. If shutting off boilers is not practical, shut off all steam mains not required for water heating.

Replace hand valves on heating and air conditioning equipment with thermostatically-controlled automatic valves.

Install storm windows. Insulate attic and outside walls.

Lower ceilings, where possible, to reduce air space for heating.

Check and repair insulation throughout the building, especially in attic spaces and on pipes, boilers, and tanks.

Install systems that use waste heat from a school building's mechanical system to heat incoming air.

Redesign, remodel, or replace obsolete or inefficient equipment.

Install systems that control the heat generated by lighting systems. Do this by capturing the heat before it enters space either by drawing return air across the fixture and back to the mechanical plant or using water-cooled fixtures.

## SPECIAL CLASSROOMS

### Homemaking

Cook by time and temperature for best results. Use minute timer for precise cooking operations.

Repair all equipment immediately and establish routine maintenance schedules. Have all ovens calibrated.

Use cold-water washing when possible.

Reduce the size of freezers to minimize on-site storage of frozen foods.

Limit pre-heating of ovens to the very minimum. In some cases, preheating is not necessary.

Decrease the amount of hot food prepared.

Don't open oven doors more than necessary to check on foods being prepared.

Keep pots and pans covered while cooking whenever possible.

Make sure burners are completely off when not in use.

Use a stopper in sink when washing dishes by hand to avoid running hot water continuously.

See to it that students in homemaking classes are made aware of the necessity for energy conservation.

Don't allow leaky hot water faucets. Locate and repair any water or steam leaks immediately.

Lower temperatures in water heaters on weekends; turn off during vacations.

Match pan size to burner unit size.

Refrigerator and freezer should be kept more than half full. Items absorb and help hold cold.

Use high heat only to bring water to a boil or to start cooking food with water. Then reduce heat level to lowest possible point.

Use small amounts of water whenever possible; they heat faster.

Keep refrigerator and freezer coils clean; replace door seal when it no longer seals tightly.

Consolidate backing activities into one day of continuous use.

Use hood fans only when necessary.

Eliminate the use of electric can openers and other "convenience" appliances.

## Shops

Reduce lighting to levels actually needed in work or training areas.

Use more hand tools; teach more hand skills; assign more students per power work station.

Coordinate shop use and classroom use for more efficient utilization of space in shop area.

Restrict use of doors in shops.

Reduce the number of forges, kilns, and smelters.

Include energy conservation techniques as a regular part of the shop curriculum.

Initiate useful projects in shops to help other departments in the school with equipment, repairs, etc.

## Drama

Design activities for a more efficient use of multi-purpose rooms.

Reduce stage lighting through the use of dimmers. Use less and lower light during rehearsals.

Make sure that lamps and reflectors are kept clean.

Use regular classroom more when small groups are practicing or performing.

## Art

Reduce hours of kiln use.

Organize more hand operations, especially in crafts.

## Business Education

Restrict the use of electric typewriters and other electric machines. Use more hand-operated equipment.

Utilize more community and business facilities for training.

Make sure that all power equipment is turned off when not in use.

Use both sides of all paper products.

## Physical Education and Sports

Restrict the use of showers to the very minimum. Reduce the capacity of shower heads to cut down on the amount of hot water used. Reduce water temperature in showers.

Lower swimming pool temperatures. Minimize filter pumping hours on pools.

Use solar heat for pools. Do not heat pools during warm or hot seasons of the year.

Keep gym temperature at 65 degrees or below.

Utilize commercial laundering of towels or have students bring their own towels.

Expand inter-mural competition to substitute for intra-mural.

Limit the geographical area of athletic competitions to reduce traveling by bus or car.

Conduct basketball, volley ball, and other game practice sessions outside as much as possible and during daylight hours.

Combine girls and boys sports as much as possible to reduce the number of hours facilities are used.

Shut off air-handling units and lights in gyms when physical education classes are being held outside.

Do not use electric scoreboards.

## MAINTENANCE AND GROUNDS

Establish inservice training programs for custodial and maintenance staffs featuring experts in the field of thermostatic control and lighting as well as manufacturing representatives who can give instruction in operating pieces of equipment at maximum efficiency. Bring operations people up to the level of skill demanded by the equipment and controls.

Organize groundsmen and maintenance personnel assignments to minimize use of trucks. Equipmaintenance trucks with all necessary tools.

Monitor use of all vehicles used in maintenance and operations.

Ration gas for all equipment. Make it stretch.

Cut grass and edge less often.

Keep all gas burning engines tuned to peak performance.

Adjust temperature in buildings where custodians work to the lowest possible comfortable temperature for physical labor.

Make warehouse deliveries and messenger service to schools on a very minimal basis.

Reschedule room cleaning to daytime as much as possible to save electricity used at night.

Do as much cleaning as possible with cold water.

Lock gas tanks on all vehicles to avoid theft.

Control purchasing of equipment to obtain the correct size.

Encourage employees to bring their lunches rather than driving home or to a restaurant.

Use the minimum amount of water for sprinkling and irrigation.

## TRANSPORTATION OF STAFF

Develop innovations and creative programs to encourage staff to walk to school or ride bikes.

Provide assistance in developing car pools for teachers and clerical workers in schools.

Use central place as point of embarkation for trips involving number of people.

Coordinate conferences out of district for sharing rides.

Use closed circuit television for meetings.

Utilize conference telephones as substitutes for small meetings.

Reassign teachers and clerical workers closer to their homes.

Coordinate transportation with other county agencies.

District personnel who serve a number of schools should plan on coordinating trips to include maximum contacts and include other district personnel serving the same schools.

Educate all workers before they embark on a trip to ask themselves: Can I deliver or do something for someone when I go on a trip?

Let school staff members ride school buses whenever feasible.

Pick an area for staff meetings which requires the least amount of driving for all concerned. Insist on car pools.

## MISCELLANEOUS

Develop specifications for the purchase of new equipment to insure that it is designed to use the minimum amount of energy within the requirements of performance, longevity, and maintenance.

Explore the concept of installing a total on-site generation of electrical energy to improve on the efficiency level of remote generating stations.

Explore the possibility of using solar and other "alternate" sources of energy in new and existing facilities.

Design and print attractive, eye-catching signs about energy conservation and put them in appropriate places.

Work with city and county planners to speed up bicycle lanes. Provide adequate and safe parking areas for bicycles at schools and offices.

Encourage employees and students to bring their lunches rather than driving home or to a restaurant.

Eliminate as many meetings and conferences as possible.

Schedule major electrical power-consuming operations such as pumping water into storage tanks during off-peak hours.

Provide facilities that are the proper size that the group needs. Do not assign rooms or buildings that are too large.

Eliminate or reduce nighttime activities that require lighting.